REMARKS:

Applicant thanks the examining attorney for his attention to the application and especially for the suggestions for improving the form of the claim which have been adopted.

Applicant also thanks the examining attorney for the indication of the Claim 12 is allowable.

The examiner has rejected Claims 1-3, 5-7, 9-11, 13 and 14 as unpatentable over Hanks in view of Shimamura and has rejected Claim 4 as unpatentable over Hanks, Shimamura and Vahavioios. The examiner has rejected Claim 15 over Hanks, Shimamura and the admitted prior art and has rejected Claims 8 and 9 over Hanks, Shimamura and Lindahl. The examiner has rejected Claims 38 and 40 over Hanks, Shimamura and Medelius.

Before considering the references and the rejection in detail it may be helpful to briefly review applicant's invention. The invention relates to the in-situ testing of transducers, that is testing transducers while they are still mechanically and electrically connected in their normal operating environment. A problem associated with such testing is that the transducer will continue to generate an output signal while it is being tested. The output signal during testing therefore has two components, a desired component responsive to the test signal and an undesired component responsive to the output of the transducer that is caused by the device to which it is attached. Hanks et al recognize this problem and describe, in col. 3, lines 61 *et. seq* isolating the piezoelectric element as follows:

"In such testing, provision is made, if and as required to isolate the physical system from the piezoelectric element."

In the present invention a different approach is taken. In accordance with applicant's invention, it is not necessary to isolate the transducer from the physical system in order to accomplish the in-situ testing. Rather, in the present invention applicant disables feedback amplifier while leaving the feedback element in place. This permits a test signal to be coupled to the transducer and the response of the transducer to the test signal to be analyzed by the signal processing circuit used to analyze the output of the transducer in normal operation.

By disabling the amplifier while leaving the feedback element in place, the transducer remains coupled to the signal processing circuit so that its response to the test signal can be measured. Moreover, disabling the charge amplifier which is normally a high gain amplifier, but leaving the feedback element in place, a higher magnitude of test signal can be applied to the transducer then would be possible if the amplifier were not disabled. The high magnitude test signal reduces the effect of any signal generated by the transducer from its connection to the physical system to a level that can be ignored.

In Hanks, the transducer is tested by measuring its response to a test signal in the nature of an impulse that momentarily energizes and thereby mechanically stresses the transducer causing the transducer to mechanically ring and produce a ringing electrical signal which characterizes the functional condition of the piezoelectric element (col. 3, lines 50-57). The ringing produced by the piezoelectric element is a signal having a magnitude similar to the magnitude of the output of the piezoelectric element when it is functioning normally and therefore in Hanks the charge amplifier is not and cannot be disabled or the ringing could not be characterized. The examiner recognizes that Hanks does not teach disabling the amplifier but suggests that Shimamura does. Applicant respectfully submits that even if Shimamura taught disabling the amplifier, doing so in Hanks' system would cause the system to fail to function. The reason that Hanks' does not disable the amplifier is that he cannot do so and still measure the ringing signal produced by the voltage impulse.

Moreover, Shimamura neither shows or suggests disabling an amplifier in a system such as Hanks' and further, Shimamura is so unlike Hanks or applicant's invention that the combination would not suggest itself to one of ordinary skill in the art.

Shimamura relates to the calibration of capacitance type alcohol concentration sensing apparatus. The alcohol concentration sensor includes a capacitive probe whose capacitance depends on the alcohol concentration of a gasoline/alcohol fuel blend. The dielectric constant of the gasoline/alcohol fuel blend has a linear relationship with the alcohol concentration and therefore the concentration can be determined by measuring the capacitance of the probe. This is done by coupling the probe to an oscillator whose frequency is determined at least in part by the capacitance of the probe, coupling the output of the oscillator to a frequency to voltage converter, and coupling the output of the converter to something that Shimamura calls an inverted amplifier. The capacitor's probe is not a transducer in the normal sense and certainly is not a transducer of the type with which Hanks is concerned or for that matter with which applicant is concerned. Shimamura's capacitance probe produces no output signal whatsoever, it is an entirely passive device whose capacitance changes depending on the concentration of the fluid within it. The output of Shimamura's probe is not amplified as is the output of the transducers of Hanks and of applicant, rather the probe is connected to an oscillator whose frequency it determines. Moreover, no test signal is applied to the capacitance sensor of Shimamura. Rather, known capacitors are connected across the probe to simulate the change in capacitance created by the presence of a fluid of known alcohol concentration. Accordingly, during testing, the oscillator and the frequency to voltage converter function in precisely the same manner as they do during normal operation of Shimamura's tester.

Admittedly, Shimamura mentions that the inverted amplifier which amplifies the output of the frequency to voltage converter may be removed. Reference to figures 6 and 7 however reveal that removing the inverted amplifier simply changes the magnitude and sense of the voltage change with alcohol concentration.

Applicant respectfully submits that Shimamura is so completely different from Hanks and from applicant's invention that there is no reason why one skilled in the art would combine them. Moreover, as already discussed, removing or disabling the charge amplifier from Hanks would destroy the operation of Hanks circuit. For these reasons, one skilled in the art would not be led by these references to combine Shimamura and Hanks, and even if the combination were made, not only would applicant's invention not result but the combination would not work. Accordingly, applicant respectfully submits that the combination of Hanks and Shimamura which forms the basis for the rejection of all of the claims fails to render applicant's invention obvious and should be reconsidered and upon reconsideration withdrawn and the application passed on to issue.

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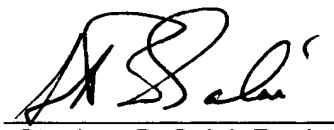
Respectfully submitted,



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